

AMBIENT AIR POLLUTION AND REGULATORY T-CELL FUNCTION IN ASTHMATIC CHILDREN

Olivier Humblet, *Stanford University School of Medicine, Stanford, USA*

Ira Tager, *School of Public Health, University of California, Berkeley*

Frederick W. Lurmann, *Sonoma Technology Inc., Petaluma, CA*

Kari C. Nadeau, *Stanford University School of Medicine, Stanford, USA*

Background: Exposure to ambient air pollution (AAP) is associated with increased severity and incidence of asthma, a disease characterized by increased inflammation. Regulatory T-cells (Treg) are newly discovered suppressors of immune response which are involved in asthma pathogenesis, and whose development and activity is regulated by the Foxp3 locus. We hypothesized that exposure to nitrogen dioxide (NO₂), ozone (O₃), and fine particulate matter (PM_{2.5}) would negatively affect function of Tregs.

Methods: Immune function was assessed in blood collected in early 2009 from 71 asthmatic children enrolled in a prospective cohort study in Fresno, CA. Treg cells (CD4⁺CD25^{hi}CD127^{lo}) were purified by flow cytometry, then used in standard ³H thymidine proliferation assays, flow cytometry, quantitative PCR, and chemotaxis assays. Daily AAP exposure for each child was estimated using a microenvironment model integrating data from multiple air monitoring sites. For this preliminary analysis, midway through participant recruitment, we assessed the associations of Jan. – Oct. 2008 daily average NO₂, O₃, and PM_{2.5} concentrations with Treg function.

Results: Median age at blood draw was 14 years. Distribution of GINA asthma severity scores at baseline: 1 = 32%, 2 = 51%, 3 = 13%, 4 = 4%. Median AAP concentrations were 6.8 ppb for NO₂, 18 ppb for O₃, and 11 µg/m³ for PM_{2.5}. No significant correlations were seen between any measures of immune function and exposure to NO₂, O₃, or PM_{2.5}. However, Foxp3 methylation was marginally-significantly inversely correlated with both O₃ ($r = -0.22$, $p = 0.06$) and NO₂ ($r = -0.18$, $p = 0.13$).

Conclusions: No significant associations were seen between AAP exposure and Treg function, possibly due to the small sample size of this preliminary analysis. Once recruitment is complete, this analysis will be re-done in the full population, with additional immune parameters.